JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1992, 25, 575–577 NUMBER 3 (FALL 1992)

THE ORGANIZATION OF BEHAVIOR

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Sonia Goltz has demonstrated that investment decisions may be affected by schedule of reinforcement, partial reinforcement, and consistent reinforcement. This is an important finding, and it raises a fundamental question: What sort of further work with reinforcement schedules is indicated? In my opinion, we are beckoned by highly promising, but as yet relatively unmined, areas of research that we may characterize as being concerned with organization or behavioral coherence. We need more work at the level of organization investigated by Sonia Goltz. And we need more work at still higher levels of organization, an almost pristine concern. In considering behavioral cohesion, we may begin with fixed-ratio schedules, as viewed by Skinner (1938).

A fixed-ratio schedule, of course, is one in which reinforcement follows a given number of responses. In considering these schedules, Skinner (1938) suggested that we conceptualize the completion of each fixed ratio as a unit, a response unit. In other words, each of the subunits of the fixed ratio, the key pecks, bar presses or whatever, leading up to the terminal reinforcement is an element of a larger whole or unit, the entire fixed ratio. This is a most important idea, one that applies to all behaviors without exception. For example, letters of the alphabet, themselves rather complicated wholes, are elements in larger units, words, which themselves are units in still larger units, and so on. Learning, we suggest, is a matter of integrating lower order units into higher order units.

What sort of reinforcement schedule is a fixed ratio? It may be considered to be a schedule of consistent reinforcement, one in which a number of subunits performed sequentially always terminate in reinforcement. Its analogue in a more Thorndikeian situation, say the straight alley, is a trip down the runway from start box to goal box, which terminates in reinforcement. This idea, by the way, is hardly original to this writer (see e.g., Keller & Schoenfeld, 1950; Logan & Wagner, 1965). Before moving forward, allow me to move backward one step. A trip down a runway is itself composed of subbehaviors that themselves are organized from lower level component behaviors. As one example, a rat must learn to orient to the closed start door at the beginning of a trial in order to enter the alley quickly once the start door is opened.

If a fixed-ratio schedule is a schedule of consistent reinforcement, what then is the analogue of partial reinforcement in the operant situation? It is the equivalent of reinforcing only some of the runway responses (i.e., reinforcing only some of the fixed ratios). In conventional terminology, a fixed-ratio schedule is a first-order schedule. Reinforcing a fixed-ratio schedule according to some other schedule, say reinforcing every other fixed ratio, is a second-order schedule. Let us pause for a moment for some necessary observations. Sonia Goltz, in employing an alternating schedule of wins (reinforcement) and losses (nonreinforcement or punishment), employed a second-order schedule. Second-order schedules, although they have been examined in the operant situation (see e.g., Platt, 1971), have been examined far more frequently in the Thorndikeian situation (see e.g., Capaldi, 1992). For example, a variety of second-order schedules, in which reinforcement and nonreinforcement have been programmed according to a great variety of regular and irregular sequences, have been examined in the runway (see e.g., Capaldi, 1966, 1967).

Let us look at the second-order schedules in Sonia Goltz's situation in a slightly different way. From her work it seems clear that a second-order schedule

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in an organizational or business setting might be that of learning that an irregular run of losses is followed by a series of wins. We often hear, for example, that after a stock market has gone down for a while, it will go up (or vice versa). Everyone is aware of such second-order relationships; as indicated, they have been examined to a considerable extent in the Thorndikeian situation. Much more remains to be done with second-order schedules in the operant situation. Sonia Goltz's work encourages us to believe that it may be profitable to examine the effects of a variety of second-order schedules in investment decisions. However, we can go beyond second-order schedules.

An animal as complicated as a rat (and this goes without saying for people) is capable of organizing events into units higher than second-order schedules. In such higher order units, call them third-order schedules if you wish, two or more second-order schedules are integrated into a higher unit. Work on third-order schedules is in its infancy. To appreciate third-order schedules, let me provide two examples, one involving rats and another a hypothetical one involving people. Recently in our laboratory, rats were trained under two different second-order schedules in a runway. Both of the schedules were regular; in one, nonreinforcement followed reinforcement (RN), and in the other, nonreinforcement followed two successive reinforcements (RRN). Speed of running was the dependent variable. Note that the decision whether to run fast (reinforcement) or slow (nonreinforcement) to the second event of each second-order schedule could not be determined on the basis of the information provided by the second-order schedule itself, because the first event in each, R, was followed by both R (RRN schedule) and by N (RN schedule). We found, however, that the rat could determine, highly accurately which of the two second-order schedules was to occur on the basis of which of the two schedules occurred 20 min earlier (see e.g., Capaldi, 1992; Capaldi, Miller, Alptekin, & Barry, 1990). In our procedure, like schedule signaled like schedule (i.e., RN signaled RN and RRN signaled RRN). In a confirmation and extension of our work, it was shown, among other things, that rats could use one second-order schedule to predict the occurrence of an entirely different second-order schedule (Haggbloom, Birmingham, & Scranton, in press).

It is important to realize that individual events become larger functional units, sometimes called chunks, on the basis of how they are grouped. Events grouped in a particular manner, at a common spatial location, in some similar temporal manner, and so on, may be forged into higher order units. Interestingly, what are powerful grouping cues for people (space and time) also seem to be powerful grouping cues for rats (e.g., Capaldi, Nawrocki, Miller, & Verry, 1986). Investment counselors are free to group events in any number of ways: by quarters, by recessions, by war followed by peace or vice versa, and so on. The important point here is that people, far more than rats, are capable of detecting relations among the relations. For example, a person may detect that after each of three quarters in which losses occurred, a quarter of profits always occurs. For purposes of this example, I am considering the schedules prevailing in each quarter as second-order schedules and the use of quarterly information to predict quarterly results as the third-order schedule. In Sonia Goltz's experiment, it would be as if three successive alternating schedules were followed by the variable schedule.

One only needs to listen to the TV program *Wall Street Week* to know that people speculate about periods of this or that being followed by periods of that or this. The units of analysis employed by such people, and thus the accuracy of their predictions, are not what concerns us here. Rather, our concern is with how adept rats or people may be at learning third-order relationships when presented with them and how accurate they may be in predicting the various events contained in each component schedule. Some questions are: What variable facilitates or impedes learning about third-order schedules, and what sorts of processes need to be postulated to explain their effects, on original acquisition, on extinction, and on transfer?

Consider a rat provided with a single alternating series of reinforced and nonreinforced trials in a runway. Even at long intertrial intervals, as long as 24 hr, rats will master this schedule, as indicated by their running fast on the reinforced trials and slow on the nonreinforced trials (see Capaldi, 1985). This behavior is perplexing in the following sense: By mastering the single alternating schedule, the rat ostensibly gains very little because the reinforced and nonreinforced trials are scheduled independently of its behavior. In fact, the rat loses something. By running slowly on the nonreinforced trial the animal delays the appearance of the reinforced trials. Elsewhere (Capaldi, 1992) I asked why rats or people bother to integrate or organize the events of the alternating schedules into a unit. We know such schedules are organized into units because, among other things, rats will detect whether a nonreinforced trial is or is not to be followed by a reinforced trial and will run more rapidly on the nonreinforced trial in the former instance (see Capaldi, 1985, 1992). In any case, I suggest that what a rat or person has to gain by organizing a single alternating or other schedule into a unit is accurate prediction, even when such prediction is costly (e.g., by delaying the onset of reinforced trials in the alternating schedule as a result of running slowly on the nonreinforced trials). Of course, the same considerations apply to third-order schedules. In our laboratory the rats, by learning that the RRN schedule was to be followed 20 min later by the RRN schedule, were able to predict what the next schedule would be. In the wild, it would obviously be valuable to the rat to determine, for example, that nonreinforcement here indicates that reinforcement is available there or that a series of two or more nonreinforcements here signal the availability of two or more reinforcements there. A similar situation prevails with respect to investment decisions (or decisions generally).

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Received March 20, 1992
Initial editorial decision March 30, 1992
Revision received April 1, 1992
Final acceptance April 16, 1992
Action Editor, John Parrish